

From: Director, Defense Modeling and Simulation Office (DMSO)
To:

Subj: PARTICIPATION IN WORKSHOP ON "REPRESENTATION OF COMMAND AND
CONTROL (C2) DECISION MAKING PROCESS IN SIMULATIONS"

For the past decade it has been apparent to DoD and U.S. field commanders that effective use of deep sensors, communications and automated decision aids will be a key component in successfully executing the next battle. All Services have active hardware/software procurement programs focused on aiding commanders in obtaining a current view of both friendly/enemy forces and supporting the command decision process. Additionally, several new simulation structures (JWARS, JSIMS, WARSIM, etc) are being developed by DoD which will support training, procurement, research and development in the coming century. If DoD's combat simulations are to effectively represent the entire battle, it is imperative that they accurately simulate the command decision activity and the impact of deep sensors, communications and information assets on this process.

With that focus, the Defense Modeling and Simulation Office (DMSO) is sponsoring a workshop on the "Representation of Command and Control Decision Making in Combat Simulations" on February 27-28, 1996. The workshop will be held in Room 121 of the Institute for Defense Analyses (IDA) in Alexandria, VA. The purpose of the workshop is to support these efforts to accurately simulate the command decision process by obtaining a baseline understanding of the current state of the art (technology issues and approaches) in modeling the Command Decision Process. The workshop will also provide a forum for the exchange of ideas between those individuals actively working in this area.

As a recognized and successful practitioner in this area, I invite you to be one of the participants and speakers at this workshop. Since our time will be limited, and the simulation of command decision making is a complex subject, I would encourage you to structure your presentation to include a description on how you have represented the processes outlined in the enclosure in your software.

I hope you will find time in your schedule to attend this workshop. Your support in advancing the state of the art in this difficult area of simulation is important to the DMSO and the DoD community.

Please notify Mr. James W. Heusmann, at extension (703) 824-3413, or by e-mail: heusmann@msis.dms0.mil of your intention to attend and/or to present an overview of your work at this conference.

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Enclosure:

1. Terms of Reference

TERMS OF REFERENCE

I. Simulated Battle Context of Command Decision Making

1) Level Of Resolution For C2 Entities -- Do C2 entities represent individual humans or aggregate decision making functions? Are team and group interactions explicitly modeled? What levels of command (e.g. echelons) are represented?

2) Level of Decision Representation -- At what echelon levels does your simulation represent the Command Decision Process? Does it include the platform level where command decisions are often those of battle engagement management (position/target selection)? Or does it also represent higher echelons of command where decisions are based on longer term battle predictions and focused on resource management?

3) Representation of Current Battle State -- How does your simulation represent the command's perception of the current battle state at each decision making echelon? Is it represented as "ground truth" or is the knowledge a result of "situation reports" from friendly forces and intelligence resources? What are the key parameters of this perceived battle state?

4) Representations And Algorithms Used For C2 Decision Making -- How do you generate, evaluate, and represent plans? How do you represent knowledge about doctrine and tactics? What techniques do you use for temporal and spatial reasoning? Do you explicitly represent the uncertainty associated with inputs and assumptions? Can your decision procedures be interrupted at any point to return a decision (i.e. for timely responses to real-time events)?

5) Representation of a Friendly Battle Plan -- Is the decision making process done in the context of a battle plan or objective in your simulation? If so, what software constructs (rule bases, finite state machines, decision tables, etc) are used to represent these plans/objectives in your simulation?

6) Representation of Enemy Objectives -- How are the perceived battle objectives of the enemy represented in your simulation? Are they "known" to simulated decision makers on a global basis within the simulation or are they dependent on sensor and situation reports? At higher echelons, are enemy activities represented in the context of support/strategic friendly battle objectives? Are enemy activities representative of soft factors, such as cultural bias, education, motivation, etc.

II. Decision Process

1) Assessment of Current/Future Status -- How does your simulation represent the assessment of the perceived battle situation against the objectives of the commander at the decision

level? Does your simulation attempt to project the future battle status and if so, how does it affect the simulated commander's decision process?

2) Decision Actions -- How are decision actions represented in your simulation? Are messages sent to/from higher to lower echelons describing the decision with the appropriate response? Or are the decisions implicitly carried out by lower echelon units?

3) Dynamic/Reactive Decision Making -- Is the decision process represented in your simulation dynamic in nature? Do you simulate a commander's recognition of a battle situation (situational awareness), alter command battle objectives and exploit the situation? Or are decisions made in a reactive mode where simulated commanders try to maintain current battle objectives?

4) Doctrinal Context -- How is doctrinal context maintained in the simulated commander's decision process?

III. Simulated Support to the Decision Process

1) Inputs Required For C2 Decisions -- What input variables are required to support C2 decision making in your model?

2) Characteristics of Information Flow Between Command and Control Entities -- What modes of information exchange are supported (e.g., regularly scheduled transmission of standardized reports from subordinates; event triggered transmission of reports from subordinates; asynchronous queries by commanders; etc.)? What information content is transmitted (e.g., which standard orders and reports are represented; are plans explicitly communicated in messages; is any attempt made to communicate the commander's intent; etc.)?

3) Sensor Support -- How do simulated sensor reports impact the simulated decision process in your simulation? Do they provide enemy status (location, resource estimate etc.)? Do they also provide input to the simulated commander's perception of enemy intent?

4) Realism of Information Flow -- Are communication nets explicitly represented? Are communications subject to battlefield effects?

5) Information operation activities -- Does your simulation also represent the impact on the simulated commander's decision process of realtime information on the status of friendly forces?

IV. Representation of Human Capabilities and Limitations

1) Do you model any of the capabilities, limitations and biases characteristic of human decision makers (e.g., learning, fatigue, stress, cognitive style)?

V. Other Issues

1) What are the primary issues you are currently facing simulating the decision making process?

2) What are the most significant technical challenges you are currently facing with your system?

3) Are there areas that you feel theoretical research needs to be conducted?

4) Are there areas where you feel important applications can be developed, given time and funding?

5) What lessons or "tricks of the trade" have been learned as a result of your efforts that could benefit other projects attempting to model the command decision making process.

6) If you could start over what would you do differently? Why?

Certainly the above list of issues is not exhaustive and you are invited to add a discussion of any others (either solved or unsolved) you have encountered as your system has been developed. It is input from experts of your stature that will help provide DMSO with a solid technical basis for Authoritative Representation of Human Behavior and provide the proper toolset for emerging OSD objectives in modeling and simulation.